

Claims:

The embodiments of the invention in which an exclusive property or privilege is claimed are, therefore, defined as follows:

1. A method of cleaning comprising the steps of: DP

selecting a substantially non-reactive, non-aqueous, non-oleophilic, apolar working fluid, said working fluid being selected from the commercial group of non-spark generating materials; 112 1st → no basis in spec

selecting at least one washing adjuvant, said washing adjuvant being selected from the commercial group of non-spark generating materials; 102 ✓

bringing said working fluid and adjuvant in contact with the fabric; ✓

and applying mechanical energy to provide relative movement within said fabric. ✓

- ② NEW  
The method of claim 1 wherein said non-reactive, non-aqueous, non-oleophilic, apolar working fluid under standard conditions is further characterized by: a KB value less than approximately 30; a surface tension less than approximately 35 dynes/cm<sup>2</sup>; and a solubility in water less than 10%. ✓

3. The method of claim 1 in which substantially all of the materials contacted by said working fluid are conductive polymers. fabric and

4. The method of claim 1 wherein said mechanical energy occurs in a chamber which confines said working fluid and fabric. maybe 112 2nd

*further*  
 5. The method of claim 4 including the step of introducing a water-in-working fluid emulsion to the chamber which confines the fabric and said working fluid.

6. The method of claim 5 wherein at least one dispensing chamber is provided and adjuvant is added to said chamber at appropriate times. *112*

7. The method of claim 6 including the step of introducing a water-in-working fluid emulsion into the adjuvant-dispensing chamber.

8. The method of claim 1 including the step of introducing a water-in-working fluid emulsion to the fabric prior to bringing the working fluid in contact with the fabric.

9. The method of claim 1 including the step of detecting the level of said working fluid in contact with the fabric for appropriate adjustment of subsequent steps in the cleaning method.

10. The method of claim 1 including the step of sensing the initial moisture content of the fabric for subsequent adjustment of steps in the cleaning method.

11. The method of claim 1 wherein the temperature inside the chamber is sensed and means are taken to ensure that the temperature does not exceed 30 °F below the flash

*what means*

point of said working fluid unless the concentration of said working fluid does not exceed its lower flammability limit.

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- Method 2 indep
12. A method of cleaning comprising the steps of: DP
- selecting a substantially non-aqueous working fluid;
  - selecting at least one washing adjuvant;
  - placing the fabric in a chamber adapted to confine said working fluid and said
- 5 fabric;
- bringing said working fluid and adjuvant in contact with the fabric in the chamber, by introducing a water-in-working fluid emulsion into the chamber;
  - and applying mechanical energy to provide relative movement of said fabric.

- Method 2 dep C12
13. The method of claim 12 wherein said working fluid is a non-reactive, non-aqueous, non-oleophilic, apolar working fluid DP OK

- Method 2 dep C13 & C12
14. The method of claim 13 wherein said non-reactive, non-aqueous, non-oleophilic, apolar working fluid under standard conditions is further characterized by: a KB value less than approximately 30; a surface tension less than approximately 35 dynes/cm<sup>2</sup>; and a solubility in water less than 10%. OK

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- Method 2 dep C12
15. The method of claim 12 in which substantially all materials in contact with said working fluid are selected from the commercial group of non-spark generating materials. dry cleaning

method 2  
dep C12

16. The method of claim 12 in which substantially all of the materials contacted by said working fluid are conductive polymers.

method 2  
dep C12

17. The method of claim 12 wherein at least one dispensing chamber is provided and adjuvant is added to said chamber at appropriate times. 112

method 2  
dep C12

18. The method of claim 12 including the step of introducing a water-in-working fluid emulsion to the fabric prior to bringing the working fluid in contact with the fabric.

method 2  
dep C12

19. The method of claim 12 including the step of detecting the level of said working fluid in contact with the fabric for appropriate adjustment of subsequent steps in the cleaning method. 112

method 2  
dep C12

20. The method of claim 12 including the step of sensing the initial moisture content of the fabric for subsequent adjustment of steps in the cleaning method. 112

method 2  
dep C12

21. The method of claim 12 wherein the temperature inside the chamber is sensed and means are taken to ensure that the temperature does not exceed 30 °F below the flash point of said working fluid unless the concentration of said working fluid does not exceed its lower flammability limit.

- method 2  
dep c12*
22. The method of claim 12 wherein the washing adjuvant is selected from a group consisting of: builders, surfactants, enzymes, bleach activators, bleach catalysts, bleach boosters, bleaches, alkalinity sources, antibacterial agents, colorants, perfumes, pro-perfumes, finishing aids, lime soap dispersants, composition malodor control agents, odor neutralizers, polymeric dye transfer inhibiting agents, crystal growth inhibitors, photobleaches, heavy metal ion sequestrants, anti-tarnishing agents, anti-microbial agents, anti-oxidants, linkers, anti-redeposition agents, electrolytes, pH modifiers, thickeners, abrasives, divalent or trivalent ions, metal ion salts, enzyme stabilizers, corrosion inhibitors, diamines or polyamines or alkoxylates, suds stabilizing polymers, solvents, process aids, fabric softening agents, optical brighteners, hydrotropes, water, suds or foam suppressors, suds or foam boosters, fabric softeners, antistatic agents, dye fixatives, dye abrasion inhibitors, anti-crocking agents, wrinkle reduction agents, wrinkle resistance agents, soil release polymers, soil repellency agents, sunscreen agents, anti-fade agents and mixtures thereof.

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- objection  
method*
23. The method of claim 26 wherein a preferred surfactant for the system will have a hydrophilic-lipophilic balance from approximately 3 to 14.

24. A method of cleaning comprising the steps of:

selecting a substantially non-aqueous working fluid;  
selecting at least one washing adjuvant;  
sensing the initial moisture content of the fabric  
bringing said working fluid and adjuvant in contact with the fabric;

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applying mechanical energy to provide relative movement within said fabric;

adjusting steps in the cleaning method in response to the initial moisture content of the fabric. *How?*

*method 3  
dep c24*

25. The method of claim 24 wherein said non-aqueous working fluid is a non-reactive, non-aqueous, non-oleophilic, apolar working fluid.

*method 3  
dep c25 → c24*

26. The method of claim 25 wherein said non-reactive, non-aqueous, non-oleophilic, apolar working fluid under standard conditions is further characterized by: a KB value less than approximately 30; a surface tension less than approximately 35 dynes/cm<sup>2</sup>; and a solubility in water less than 10%.

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*method 3  
dep c24*

27. The method of claim 24 in which substantially all materials in contact with said working fluid are selected from the commercial group of non-spark generating materials.

*method 3  
dep c24*

28. The method of claim 24 wherein said mechanical energy occurs in a chamber which confines said working fluid and fabric.

*method 3  
dep c28 → c24*

29. The method of claim 28 including the step of introducing a water-in-working fluid emulsion to the chamber which confines the fabric and said working fluid.

Method 3  
dep C24  
30. The method of claim 24 wherein the above sensing step is carried out by sensing the humidity of the fabric to be cleaned.

Method 3  
dep C24  
31. The method of claim 24 wherein the above sensing step is carried out by sensing the conductivity of the fabric.

Method 3  
dep C24  
32. The method of claim 24 wherein the above sensing step is carried out by sensing the humidity of the air.

Method 3  
dep C24  
33. The method of claim 24 wherein the above sensing step is carried out inside the chamber.

Method 3  
dep C24  
34. The method of claim 24 wherein the temperature inside the chamber is sensed and means are taken to ensure that the temperature does not exceed 30 °F below the flash point of said working fluid unless the concentration of said working fluid does not exceed its lower flammability limit.

Method 4  
indep  
35. A method of cleaning comprising the steps of:

selecting a substantially non-reactive, non-aqueous, non-oleophilic, apolar working fluid;

selecting at least one washing adjuvant from a group consisting of: builders, surfactants, enzymes, bleach activators, bleach catalysts, bleach boosters, bleaches, alkalinity sources, antibacterial agents, colorants, perfumes, pro-perfumes, finishing

D.P.

aids, lime soap dispersants, composition malodor control agents, odor neutralizers,  
 polymeric dye transfer inhibiting agents, crystal growth inhibitors, photobleaches,  
 heavy metal ion sequestrants, anti-tarnishing agents, anti-microbial agents, anti-  
 10 oxidants, linkers, anti-redeposition agents, electrolytes, pH modifiers, thickeners,  
 abrasives, divalent or trivalent ions, metal ion salts, enzyme stabilizers, corrosion  
 inhibitors, diamines or polyamines or alkoxylates, suds stabilizing polymers,  
 solvents, process aids, fabric softening agents, optical brighteners, hydrotropes,  
 water, suds or foam suppressors, suds or foam boosters, fabric softeners, antistatic  
 15 agents, dye fixatives, dye abrasion inhibitors, anti-crocking agents, wrinkle reduction  
 agents, wrinkle resistance agents, soil release polymers, soil repellency agents,  
 sunscreen agents, anti-fade agents and mixtures thereof;

bringing said working fluid and adjuvant in contact with the fabric; and

applying mechanical energy to provide relative movement within said fabric 1.

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36. The method of claim 35 wherein said non-reactive, non-aqueous, non-oleophilic,  
 apolar working fluid under standard conditions is further characterized by: a KB  
 value less than approximately 30; a surface tension less than approximately 35  
 dynes/cm<sup>2</sup>; and a solubility in water less than 10%.

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37. The method of claim 35 in which substantially all materials in contact with said  
 working fluid are selected from the commercial group of non-spark generating  
 materials.



method 4  
dep c 35 38. The method of claim 35 in which substantially all of the materials contacted by said working fluid are conductive polymers. 112 200

method 4  
dep c 35 39. The method of claim 35 wherein said mechanical energy occurs in a chamber which confines said working fluid and fabric. 112 200

method 4  
dep c 35 40. The method of claim 35 including the step of detecting the level of said working fluid in contact with the fabric for appropriate adjustment of subsequent steps in the cleaning method. 112 200

method 4  
dep c 35 41. The method of claim 35 wherein a preferred surfactant for the system will have a hydrophilic-lipophilic balance from approximately 3 to 14. 112 200

method 5  
indep 42. A method of cleaning comprising the steps of:

placing the fabric in a chamber adapted to confine said working fluid and said fabric;

sensing the initial moisture content of the fabric;

5 selecting a substantially non-aqueous working fluid, said working fluid being selected from the commercial group of non-spark generating materials;

10 selecting at least one washing adjuvant from a group consisting of: builders, surfactants, enzymes, bleach activators, bleach catalysts, bleach boosters, bleaches, alkalinity sources, antibacterial agents, colorants, perfumes, pro-perfumes, finishing aids, lime soap dispersants, composition malodor control agents, odor neutralizers,

polymeric dye transfer inhibiting agents, crystal growth inhibitors, photobleaches, heavy metal ion sequestrants, anti-tarnishing agents, anti-microbial agents, anti-oxidants, linkers, anti-redeposition agents, electrolytes, pH modifiers, thickeners, abrasives, divalent or trivalent ions, metal ion salts, enzyme stabilizers, corrosion inhibitors, diamines or polyamines or alkoxylates, suds stabilizing polymers, solvents, process aids, fabric softening agents, optical brighteners, hydrotropes, water, suds or foam suppressors, suds or foam boosters, fabric softeners, antistatic agents, dye fixatives, dye abrasion inhibitors, anti-crocking agents, wrinkle reduction agents, wrinkle resistance agents, soil release polymers, soil repellency agents, sunscreen agents, anti-fade agents and mixtures thereof;

said washing adjuvant being selected from the commercial group of non-spark generating materials;

bringing said working fluid and adjuvant in contact with the fabric in the chamber, by introducing a water-in-working fluid emulsion into the chamber;

applying mechanical energy to provide relative movement of said fabric; and

adjusting steps in the cleaning method in response to the initial moisture content of the fabric. How?

- method 5  
dep c42
43. The method of claim 42 wherein said working fluid consists of a non-reactive, non-aqueous, non-oleophilic, apolar working fluid under standard conditions, said working fluid further being characterized by: a KB value less than approximately 30; a surface tension less than approximately 35 dynes/cm<sup>2</sup>; and a solubility in water less than 10%.

*method 5  
dep c43 → c42* 44. The method of claim 43 in which substantially all of the materials contacted by said working fluid are conductive polymers.

*method 5  
dep c44 → c43 → c42* 45. The method of claim 44 wherein the temperature inside the chamber is sensed and means are taken to ensure that the temperature does not exceed 30 °F below the flash point of said working fluid unless the concentration of said working fluid does not exceed its lower flammability limit.

*method 5  
dep c43 → c42* 46. The method of claim 43 wherein a preferred surfactant for the system will have a hydrophilic-lipophilic balance from approximately 3 to 14.

*method 5  
dep c42* 47. The method of claim 42 including the step of introducing a water-in-working fluid emulsion to the chamber which confines the fabric and said working fluid.

*method 5  
dep c42* 48. The method of claim 42 including the step of detecting the level of said working fluid in contact with the fabric for appropriate adjustment of subsequent steps in the cleaning method.

*method 5  
dep c42* 49. The method of claim 42 wherein the temperature inside the chamber is sensed and means are taken to ensure that the temperature does not exceed 30 °F below the flash point of said working fluid unless the concentration of said working fluid does not exceed its lower flammability limit.

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50. The method of claim 42 wherein a preferred surfactant for the system will have a hydrophilic-lipophilic balance from approximately 3 to 14.

method 5  
dep c42